Subject Name: Pharmacology **Subject Code:** 20221

WINTER – 2023 EXAMINATION
Model Answer – Only for the Use of RAC Assessors

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Important Instructions to examiners:

1) The answers should be examined by key words and not as word-to-word as given in the model answer scheme.
2) The model answer and the answer written by candidate may vary but the examiner may try to assess the understanding level of the candidate.
3) The language errors such as grammatical, spelling errors should not be given more Importance (Not applicable for subject English and Communication Skills.
4) While assessing figures, examiner may give credit for principal components indicated in the figure. The figures drawn by candidate and model answer may vary. The examiner may give credit for any equivalent figure drawn.
5) Credits may be given step wise for numerical problems. In some cases, the assumed constant values may vary and there may be some difference in the candidate's answers and model answer.
6) In case of some questions credit may be given by judgement on part of examiner of relevant answer based on candidate's understanding.
7) For programming language papers, credit may be given to any other program based on equivalent concept.
8) As per the policy decision of Maharashtra State Government, teaching in English/Marathi and Bilingual (English + Marathi) medium is introduced at first year of AICTE diploma Programme from academic year 2021-2022. Hence if the students write answers in Marathi or bilingual language (English +Marathi), the Examiner shall consider the same and assess the answer based on matching of concepts with model answer.

Q. No.	Sub Q. N.	Answer	Marking Scheme
1		**Answer any SIX of the following:**	**30 M**
1.	**a**	**Classify antibiotics. Write note on anthelmintics.** **Classification:** 1) Effective against gram-positive bacteria a) Used for systemic infections eg. Penicillin, Erythromycin b) Used topically e.g. Bacitracin. 2) Effective against Gram Negative bacteria	**3M Classify** **2M** **Note**

a) Used for systemic infections eg Streptomycin, Kanamycin

b) Used locally in intestinal infections eg. Paromomycin

3) Effective against both gram positive and Gram Negative bacteria

a) Used for systemic infections eg. Ampicillin, Amoxicillin ,Carbenicillin

b) Used topically eg. Neomycin, Framycetin

4) Effective against gram-positive and gram-negative bacteria ,rickettsiae and

Chlamydia eg Tetracycline, Chloramphenicol

5) Effective against acid fast bacilli eg. Rifampicin, Streptomycin

Based on site of action antibiotics can be classified as:

1. Inhibitors of cell wall synthesis eg Penicillins

2. Inhibitors of cell membrane function eg. Polymixin

3. Inhibitors of protein synthesis eg. Tetracyclins

4. Inhibitors of nucleic acid synthesis/ function; eg. Rifampicin

5. Inhibitors of metabolism eg. Sulpha drugs.

Or

Effective against gram +ve bacteria: Penicillin etc

Effective against gram -ve bacteria: Streptomycin etc

Effective against both gram +ve & gram -ve bacteria:

Tetracycline, Chloramphenicol.etc

Effective topically :Framycetin ,Polymyxin B,neomycin etc

		Any other correct classification can be considered. **Note on Anthelmintics**: Anthelmintics are the pharmacological agents which kill or expel the worms and are used in treatment of helminthiasis. **Classification:** 1. For roundworm, hookworm and pinworm: Mebendazole, albendazole, piperazine, levamisole, pyrantel pamoate 2. For whipworm, Trichinella spiralis: Mebendazole, albendazole. 3. For tapeworms: Praziquantel, niclosamide, albendazole. 4. For Hydatid disease: Mebendazole. 5. For threadworm: Ivermectin, albendazole 6. For filariasis: Diethylcarbamazine, ivermectin, albendazole. OR any other correct classification	
1.	**b**	**What are different routes of drug administration? Write the advantages and disadvantages of IV route.** Enteral – Parenteral – Local applications **Enteral -** • drug placed directly in the GI tract • Sublingual - placed under the tongue • oral - swallowing • rectum - Absorption through the rectum (enema) **Parenteral:** • Inhalation • Injections: Intravenous, Intramuscular ,Intradermal, Subcutaneous ,Intrathecal , Intraperitoneal , Intramedullary , Intraarticular etc	**3M ROA** **1M Adv.** **1M Disadv.**

Local Application

Or tabular format

Enteral			Parenteral		Local applications
Oral	**Sublingual**	**Enema**	**Injections**	**Inhalations**	
		Retention Evacuant	**Intravenous**		
			Intraarterial		
			Intramuscular		
			Subcutaneous		
			Intraperitoneal		
			Intrathecal		
			Intramedullary		
			Intraarticular		

Advantages :

1. Has rapid onset of action
2. 100% bioavailability
3. It is useful in medical emergencies and so is a life saving route
4. It can be employed in unconscious, uncooperative patients.
5. Drugs which irritate the stomach can be given by this route.
6. It avoids drug degradation by digestive juices in GIT ,or by

		first pass metabolism in the liver. 7. Accuracy of dose 8. It is useful in case of vomiting and diarrhoea **Disadvantages** 1. Once administered, difficult to withdraw, hence less safe 2. More expensive 3. Self-medication difficult 4. Aseptic technique and skill required, Proper care should be taken to avoid infection 5. only aqueous solution can be given.	
1.	**c**	**Describe oral hypoglycemic agents with reference to it's classification and examples. Why insulin is not used by oral route.** Oral hypoglycemics are pharmacological agents when administered orally decrease blood glucose level. **Classification:-** 1) **Sulfonylureas** a) First generation:- Ex. Tolbutamide, Chlorpropamide. b) Second generation:-Ex. Glibenclamide, Glipizide, Gliclazide. 2) **Biguanides:** Metformin, Phenformin. 3) **Thiazolidinediones:** Pioglitazone. 4) **Meglitinides:** Repaglinides. 5) **Alpha Glucosidase inhibitors**: Acarbose. 6) **Newer agents**: Sitagliptin, Extenaide, Canagliflozin etc. OR A. **Enhance insulin secretion** 1. Sulfonylureas i) First generation:- Ex. Tolbutamide ii) Second generation:-Ex. Glibenclamide, glipizide, gliclazide. 2. Meglitinides Ex. Repaglinide, Nateglinide. 3. Glucagon like peptide-1 receptor agonists	**Description 3M** **2M For Justification**

		Ex. Exenatide, Liraglutide. 4. Dipeptidyl peptidase-4 inhibtors Ex. Sitagliptin, Vildagliptin, Saxagliptin. B. **Overcome insulin resistance** I) Biguanide: Ex. Metformin. II) Thaizolidinediones: Ex. Pioglitazone. C. **Miscellaneous antidiabetic drugs** a) alpha glucosidase inhibitors: Ex. Acarbose, Miglitol. b) Sodium glucose cotransport-2:- Dapagliflozin. **Why insulin is not used by oral route?** I. Insulin is a polypeptide hormone secreted by beta cells of islets Langerhans of pancreas. II. Commercially it is extracted from pancreas of cattle or pigs or made by biotechnology methods III. When given orally proteolytic enzymes and gastric juice, hydrochloric acid in stomach causes its degradation, polypeptide is fragmented and therapeutic effect is lost. Hence Insulin is not given by oral route.	
1.	**d**	**Discuss different drugs used in the treatment of angina pectoris. Write mechanism of action of any one drug.** **Angina pectoris:** - It is a symptom resulting due to cardiac ischemia . It is described as a condition in which there is a compressing type of pain in the chest. 1. Nitrates:- a) Short acting:- eg. Glyceryl trinitrate, Nitroglycerine. b) Long acting:- eg. Isosorbide dinitrate, Isosorbide mononitrate, Pentaerythritol tetranitrate. 2. Beta blockers:- eg. Propranolol, Metoprolol, Atenolol 3. Calcium channel blockers:-eg.Verapamil, Diltiazem ,Nifedipine, felodipine, amlodipine 4. Potassium channel blockers:-eg. Nicorandil	**3M Classification 2M MOA**

		5. Miscellaneous-eg. Ranolazine **Mechanism of action of nitrates:** Organic nitrates are rapidly denitrated enzymatically in the smooth muscle cells to release the reactive free radical nitric oxide which causes a direct relaxant effect on vascular smooth muscles, and the dilation of coronary vessels improves oxygen supply to the myocardium. **Note: Any other drug mechanism can be considered.**	
1.	**e**	**Define General anaesthetics. What is Schizophrenia? Mention drugs used in treatment of Schizophrenia.** **Definition:** General anaesthetics are the pharmacological agents which produce reversible loss of consciousness by depressing CNS Ex. Thiopentone sodium, Nitrous oxide, Propofol, Diethyl ether **Schizophrenia** is a major psychotic disorder of split personality in which person is detached from reality. Schizophrenia may result in some combination of hallucinations, delusions, emotional outbursts, lack of interest in surrounding and overall disturbed thinking. Excess of dopamine in brain is associated with Schizophrenia. 1) Phenothiazines a) aliphatic side chain: Chlorpromazine, Triflupromazine b) piperidine side chain: Thioridazine c) piperazine side chain: Trifluoperazine, Fluphenazine 2) Butyrophenones: Haloperidol, Trifluperidol, Penfluridol 3) Thioxanthenes : Flupenthixol 4) Other heterocyclics: Pimozide, Loxapine. 5) Atypical antipsychotics: Clozapine, Olanzapine etc.	**1M def. 1M Schi. 3M Treat.**
1.	**f**	**i) Give the pharmacological action of Adrenaline.** • Heart: - adrenaline with its action on B-receptors of heart increases heart rate, force of contraction and cardiac activity. • Blood vessels and blood pressure:- the blood vessels of skin and mucous	**2.5M Each**

membrane are constricted. Adrenaline dilates blood vessels of skeletal muscles by acting on B-receptors. The net result is thus decrease in peripheral resistance. It shows biphasic response on blood pressure in moderate dose

- Smooth muscles: -
- a) Bronchial smooth muscles: - adrenaline is a powerful bronchodilator
- b) Smooth muscles of GIT: - The muscles of GIT are relaxed and peristaltic movement becomes sluggish.
- c) Central Nervous system: - Therapeutic doses of adrenaline may give rise to tremors, restlessness, palpitation and apprehension
- Metabolism: - it produces hyperglycaemia by accelerating glycogenolysis in the liver.
- Antiallergic action: - adrenaline is a physiological antagonist of histamine and counters the bronchoconstriction and hypotension of anaphylactic shock. If combined with local anaesthetic, prolongs its action.
- Action on eye: Adrenaline causes mydriasis.

ii) Classify Parasympathomimetics with examples.

A)Ester of Choline-Methacholine, Carbachol, Acetylcholine.

B) Cholinomimetic alkoloids- Piolcarpine, Muscarine.

C) Cholinesterase inhibitor-

a) Reversible :-Neostigmine, physostigmine, pyridostigmine.

b) Irreversible:- Organophosphorus compounds, (DFP, malathion, parathion)

1.	g	**Write treatment of peptic ulcer by classifying the drugs used and mention mechanism of action of each category.** **Classification:** **A. Drugs that neutralize acid :** Antacids- sodium bicarbonate ,Aluminium hydroxide. **B. Drugs that reduce acid secretion:** H2 receptor antagonist - Eg. Cimetidine, Ranitidine. Proton pump Inhibitor : Eg. Omeprazole,pantoprazole. Anticholinergics: E.g. Pirenzepine. Prostaglandins**:** Eg. Misoprostol. **C. Drugs acting on ulcer:** Sucralfate, Colloidal bismuth. **D. Antibacterials**:. Eg. Amoxicillin, Clarithromycin, Metronidazole. OR I.**Reduction of gastric acid secretion.** o H2-antihistamines: Cimetidine, Ranitidine, and Famotidine. o Proton pump inhibitors: Omeprazole, Lansoprazole, and Pantoprazole. o Anticholinergics: Pirenzepine, Oxyphenonium. o Prostaglandin analogues: Misoprostol. II. **Neutralization of gastric acid (Antacids).** o Systemic: NaHCO3 and Sodium citrate. o Nonsystemic: Mg(OH)2, CaCO3, Aluminium hydroxide gel and Magnesium trisilicate. III. **Ulcer protectives:** Sucralfate, Colloidal Bismuth Subcitrate (CBS). IV. **Anti-Helicobacter pylori drugs**: Amoxicillin, Clarithromycin, Metronidazole, Tinidazole, and Tetracycline. • **H2 antihistamines**-These drugs block histamine- induced gastric acid secretions. Inhibit acid production by reversible competing with histamine for binding with	**3M Treatment 2M For Mech.**

		H2 receptor on the basolateral membrane of parietal cells. • **Proton pump inhibitors** (PPIs) block the gastric H,K-ATPase, inhibiting gastric acid secretion. • **Antacids** are basic substances which neutralise gastric acid and raise pH of gastric contents. Peptic acidity is reduced if pH rises above 4. • **Ulcer protectives** like sucralfate does not inhibit gastric acid, but rather, reacts with existing stomach acid to form a thick coating that covers the surface of an ulcer, protecting the open area from further damage. • **Anti H pylori drugs-**drugs like Amoxicillin,an antibiotic acts by inhibition of bacterial cell wall synthesis, leading to cell death.	

Q. No.	Sub Q. N.	Answer	Marking Scheme
2		**Answer any TEN of the following:**	**30M**
2	**a**	**Describe the factors influencing absorption of drugs. Explain any one factor.** **Note : Question might be Enlist and explain anyone. Consider it as Enlist and explain anyone.** **I) Biological factors/ physiological factors / Intrinsic factors:** **a) pH of drug and pH of GIT:**pH of GIT and Blood may interfere with the absorption of the drug. E.g. Salicylate and barbiturates (acidic drugs) remain in unionized form in the stomach, and in the acidic pH of the stomach, they are rapidly absorbed.Basic drugs like pethidine and ephedrine are only absorbed in the small intestine, as these drugs exist in un-ionised form in an alkaline environment. Unionized drugs are lipid soluble while ionized drugs are water-soluble agents. Hence unionized drugs are better absorbed than ionized drugs.	**Enlist 1.5M** **Explanat1.5 M**

b) Presence of food and other agents: Most drugs are better absorbed in an empty stomach. The presence of food in the stomach dilutes the drug and retards absorption of drugs. E. g. Ampicillin, Aspirin, tetracycline etc. The presence of other drugs in the gut may increase or decrease the absorption of drug by drug-drug interaction e.g. Presence of vitamin C increases the absorption of iron salts. from the gut. presence of calcium, magnesium decreases the absorption of tetracycline by forming a poorly absorbed chelate complex. Liquid paraffin reduces the absorption of fat-soluble vitamins like A, D, E and K.

c) Surface area : The larger the surface area the better the absorption. Drugs are better absorbed in the intestine than in the stomach because of the large surface area of the intestine. Gastrointestinal surgery reduces the absorption of drugs because of decrease in surface area.

d)Functional integrity of gastrointestinal tract/ Gastrointestinal transit time: The motility of the stomach is important to the rate at which orally administered drug is passed on to the intestine. Delayed gastric emptying reduces the absorption of orally administered aspirin. Food also affects gastric emptying time. Absorption of amoxicillin, ampicillin and cephalexin is reduced in the presence of food. This is due to enhanced gastric emptying. An increase in peristalsis reduces the residence time of the drug in GIT, So reduces absorption.

e)Blood flow in GIT: The increase of blood flow in the gut due to vasodilation increases the absorption of drugs. Decrease of blood flow in the gut due to vasoconstriction as in haemorrhagic shock decreases absorption of drugs.

II) Pharmaceutical factors/ Extrinsic factors:

a) **Physical state of the drug**: Liquids are better absorbed than solid medications. Aqueous solutions are more quickly absorbed than oily solutions. Soluble drugs are more easily absorbed than insoluble ones.

b) Particle size: Smaller the particle size, the better the absorption since it provides a greater surface area for absorption. Small particle size is useful in the absorption of corticosteroids and antibiotics like Chloramphenicol, Griseofulvin and oral anticoagulants.

		c) Formulation: The method of formulation influences absorption. Substances like lactose, sucrose, starch, calcium phosphate, and calcium lactate are used as inert diluents in formulating tablets and powders. These are the agents that may interfere with the active drug and affect its absorption. Eg. calcium and magnesium ions reduce the absorption of tetracycline. **d) Disintegration time of drug:** It is the time taken for the solid dosage form of a drug to disintegrate into fine particles in the gut completely. It depends on the type of drug and excipients used in it. If the disintegration time is longer, the absorption of the drug is delayed. **e) Dissolution time of drug :** It is the time taken for a solid dosage form of a drug to go into the solution in the gut after it has been disintegrated. The solution is absorbed faster than the solid dosage form. If dissolution time is longer, the absorption of the drug is delayed.	
2	**b**	**Classify NSAIDS with examples.** **A) Non selective COX inhibitors (traditional NSAIDS)** 1.Salicylates and analogs eg. Aspirin 2. Propionic acid derivatives: eg. Ibuprofen, Naproxen, Ketoprofen, Flurbiprofen. 3. Anthranilic acid derivatives: eg. Mefenamic acid. 4. Aryl-acetic acid derivatives: eg. Diclofenac, Aceclofenac. 5. Oxicam derivatives: eg. Piroxicam,Tenoxicam. 6. Pyrrolo-pyrrole derivative:	**3 M**

eg. Ketorolac.

7. Indole derivative:

eg. Indomethacin.

8. Pyrazolone derivatives:

eg. Phenylbutazone, oxyphenbutazone.

B) Preferential COX-2 inhibitors

Eg. Nimesulide, Meloxicam, Nabumetone

C) Selective COX-2 inhibitors

Eg. Celecoxib, Etoricoxib, Parecoxib

D) Analgesic-antipyretics with poor anti-inflammatory action

1. Para aminophenol derivative:-

Eg. Paracetamol

2. Pyrazolone derivatives:-

Eg. Propyphenazone.

3. Benzoxazocine derivative:-

Eg. Nefopam.

OR

1) Salicylates

Eg. Aspirin, Sodium salicylate

2) Para aminophenol derivatives

eg. Paracetamol, Phenacetin

3) Indole acetic acid derivatives

		eg. Indomethacin 4) Anthranilic acid derivatives eg. Mefenamic acid 5) Propionic acid derivatives eg Ibuprofen, Naproxen 6) Oxicam derivatives eg Piroxicam 7) Pyrazolone derivatives eg Phenylbutazone, Oxyphenbutazone 8) Phenyl acetic acid derivatives eg Diclofenac 9) COX 2 inhibitors eg. Rofecoxib 10) Miscellaneous eg. Nimesulide, Metamizol etc.	
2	**c**	**Classify antifungal drugs with examples.** 1. Antibiotics: Ex. Amphotericin B, Nystatin, Hamycin, Griseofulvin. 2. Antimetabolite: Ex. Flucytosine (5-FC). 3. Azoles: (a) Imidazoles: Topical: Ex.Luliconazole, Clotrimazole, Miconazole, Oxiconazole. Systemic: Ex. Ketoconazole. (b) Triazoles (systemic): Ex. Fluconazole, Itraconazole, Voriconazole, Posaconazole. 4. Allylamine: Terbinafine. 5. Other topical agents: Tolnaftate, Undecylenic acid, Benzoic acid.	**3M Each**

2	d	**Define and classify antihypertensive drugs with examples.** Antihypertensive drugs are the agents used in treatment of hypertension or abnormal elevation in blood pressure. **Classification** (According to site of action): 1. Centrally acting Drugs: Clonidine, Methyldopa 2. Drugs acting on autonomic ganglia: Hexamethonium 3. Drugs acting on post ganglionic sympathetic nerve endings a) Adrenergic neuron blockers; Guanethidine b) Catecholamine depletors: Reserpine 4. Drugs acting on adrenergic receptors: a) Alpha adrenergic blockers: Phentolamine b) Beta adrenergic blockers: Propranolol 5. Vasodilators: Hydralazine 6. Drugs acting reflexly by stimulating baroreceptors: Veratrum 7. Oral Diuretics: Thiazides, Frusemide, spironolactone, amiloride etc 8. Calcium Channel Blockers: Nifedipine, Amlodipine, Felodipine 9. Drugs acting on renin angiotensin system: a) ACE inhibitors: Enalapril, Ramipril b) Angiotensin Receptor Blockers: Losartan, Telmisartan 10.Miscellaneous: MAO inhibitors (Pargyline).	**1M Def.** **2M Classi**.

2	e	**What is haematinics? Give uses of anticoagulant drugs.** **Haematinics:** Are the drugs which when administered favour erythropoiesis i.e. synthesis of red blood cells and increase the oxygen carrying capacity of the blood. Eg: cyanocobalamin, folic acid, iron etc. **Uses of anticoagulant:** A. In treatment and secondary prophylaxis of: • (a) Deep vein thrombosis (DVT). • (b) Pulmonary embolism (PE). B. Prophylaxis of thromboembolism (e.g., stroke) in patients with the following: • (a) Valvular atrial fibrillation and non-valvular atrial fibrillation. • (b) Heart valve replacement. • (c) Heart failure. • (d) Myocardial ischemia.	**1M define with example 2 M** **Uses**
2	f	**Explain mechanism of action and side effects of sulphonamides.** Mechanism - Many microorganisms require Para amino benzoic acid (PABA) for the synthesis of folic acid. PABA & sulphonamides are similar in chemical structure such that bacteria are not able to differentiate them. There is also competition between these two substances for the same receptor site. Bacteria take up sulphonamide instead of PABA & inhibit formation of folic acid which is required for the bacterial growth and has bacteriostatic action. **Side effects** - crystalluria, haematuria, agranulocytosis, renal impairment, allergic reactions	**2M MOA** **1M Side effects**
2	g	**What are diuretics? Explain thiazides as diuretics.** These are the pharmacological agents which when administered, increase rate of formation of urine as well as excretion of urine. Examples: Mannitol, Theophylline, Acetazolamide, Furosemide, Spironolactone, Chlorothiazide etc. **Explanation:**	**Intro. 1M** **Explain 2M**

		The main site of action is distal tubule where it blocks active reabsorption of sodium ions and chloride ions with water in the distal tubule. This causes excretion of sodium ion, chloride ion , water and little potassium ions also and produces diuretic action.	
2	**h**	**Write a note on Antithyroid drugs.** **Antithyroid drugs** These are the pharmacological agents which are used in the treatment of hyperthyroidism. **Classification** **1) Thiourea derivative** eg. Propylthiouracil , Carbimazole **2) Ionic inhibitors** Eg. Potassium thiocyanate, Potassium perchlorate **3) Iodides** eg. Potassium iodide, Sodium iodide **4) Radioactive Iodine** eg.131I (iodine isotopes).	**3M**
2	**i**	**Explain triple response of Histamine.** **TRIPLE RESPONSE:** When histamine is applied locally or injected intradermally on skin histamine produces a typical response known as "triple response" which is characterized by three distinguish sign: i. **Flush**- it is redness at the site of application because of hyperaemia ii. **Flare**- Patch formation in the vicinity of 1.5 cm of flush occurs due to vasodilation & this is called flare. iii. **Wheal**- around 1.5cm of flare permeation of fluid occurs, raising the surface and its called as wheal (swelling formation).	**3M**
2	**j**	**Define Hypnotics. Classify with suitable examples.** **Hypnotics** are the pharmacological agents which act on CNS, and produce sleep resembling natural sleep Eg. Phenobarbitone, Amylobarbitone etc.	**Def. 1M, Classi. 2M**

Classification-

I) Barbiturates

a) Long acting barbiturates e.g. Phenobarbitone

b) Intermediate acting barbiturates e.g. Cyclobarbitone, Amylobarbitone

c) Short acting barbiturates e. g. Hexobarbitone, Secobarbitone

d) Ultra short acting barbiturates e. g. Thiopentone, Methohexitone

II) Non barbiturates

a) Benzodiazepine e.g. Diazepam,Chlordiazepoxide

b) Alcohols e.g. Chloral hydrate, Ethyl alcohol

c) Aldehydes e. g. Paraldehyde

d) Miscellaneous e.g. Hyoscine ,Meprobamate

OR

I) Derivatives of urea:

i) Barbiturates

a) Long acting barbiturates (duration 8hr or more)

e.g. Phenobarbitone.

b)Intermediate acting barbiturates (duration 4hrs)

e.g. Amylobarbitone.

c) Short acting barbiturates (duration less than 4hrs)

e. g. Hexobarbitone, Secobarbitone.

d) Ultra short acting barbiturates(These agents give instantaneous action and the duration of action is less than 1hr.)

		e. g. Thiopentone, Methohexitone. **ii) Related diureides:** eg. Glutethimide, Methyprylon. **II) Benzodiazepines** e.g. Diazepam,Chlordiazepoxide. **III) Alcohols** e.g. Chloral hydrate, Ethyl alcohol. **IV) Aldehydes** e. g. Paraldehyde. **V) Acetylated carbinols** e.g. Ethomidate, Ethchlorvynol. **VI) Miscellaneous** e.g. Hyoscine, Meprobamate. **VII) Inorganic ions** e.g. Bromide	
2	**k**	**Write use and one example of:** **i) Expectorant-** Use: These are the pharmacological agents which are used to remove mucus from the respiratory tract and are used in productive cough associated with bronchitis, Asthma, Emphysema Eg. Guaifenesin, Potassium iodide, Vasaka, Ammonium chloride. **ii) Bronchodilator-** Use: It is used in the treatment of bronchial asthma. Used in bronchospasm Used in COPD (Chronic pulmonary obstructive disease) Eg. Salbutamol,Terbutaline,Adrenaline,Ephedrine,Isoprenaline,Theophylline, Aminophylline etc.	**1.5M each (one use and one example)**
3		**Attempt ALL of the following**	**1M Each**

3	a	**Drugs administered through the following route are most likely to be subjected to first pass metabolism.** **i) Oral ii) Sublingual iii) Subcutaneous iv) Rectal** Ans:- Oral	**1M**
3	b	**Give two examples of neuromuscular blocking agents.** Ans: D.tubocurarine,Pancuronium,Gallamine,Alcuronium,Succinylcholine, Vecuronium, Mivacurium, Atracurium etc. **(Any other correct examples can be considered).**	**1M**
3	c	**The B1 receptor are located in** **i) Heart** **ii) Lungs** **iii) Kidney** **iv) Adrenal gland** Ans: i) Heart , iii) Kidney **(Any one of these two answers can be considered).**	**1M**
3	d	**Local anaesthetics produce :** i) Analgesia, amnesia,loss of consciousness ii) Blocking pain sensation without loss of consciousness iii) Alleviation of anxiety and pain with an altered level of consciousness iv) A stupor or somnolent state. **Ans:** ii) Blocking pain sensation without loss of consciousness.	**1M**
3	e	**Give two examples of mydriatics.** Ans: Phenylephrine,Adrenaline,Atropine,Homatropine,Cyclopentolate,Tropicamide. **(Any other correct examples can be considered).**	**1M**
3	f	**If the pressure inside eye is higher than normal person,** i) May Have cataract. ii) May be at risk of glaucoma.	**1M**

		iii) Need eye glasses iv) Have infection Ans: May be at risk of glaucoma.	
3	**g**	**Give two examples of drugs used as nootropic agents.** Ans: Piracetam, Pyritinol ,Modafinil, Caffeine, L-Theanine, Panax Ginseng, Gingko biloba, Brahmi. (**Any other correct examples can be considered).**	**1M**
3	**h**	**Phenytoin is used in the treatment of……** **Ans:** Epilepsy, Cardiac arrhythmia **(anyone correct Ans, can be considered)**	**1M**
3	**i**	**Statins are used in atherosclerosis. state true or false.** **Ans:** True	**1M**
3	**j**	**Give an example of one drug used in the treatment of manic depressive illness.** Ans: Lithium , Valproic acid , Divalproex sodium , Carbamazepine, Lamotrigine **(Any other correct example can be considered)**	**1M**
3	**k**	**Give an example of one thrombolytic agent.** Ans:Streptokinase,Alteplase,Reteplase.Tenecteplase.Urokinase.Prourokinase. Anistreplase. **(Any other correct example can be considered)**	**1M**
3	**l**	**Define laxative** Ans: These are the agents which when administered relieve constipation without gripping pain and loss of water. OR Laxatives are substances that loosen stools and increase bowel movements.	**1M**
3	**m**	**Antidiuretics are the drugs which have following action** **i) Increase urine output** **ii) Decrease urine output** **iii) Stop urine formation** **iv) Cause drowsiness** **Ans**: ii) Decrease urine output	**1M**
3	**n**	**…….. is caused by deficiency of Vitamin D.**	**1M**

		Ans: Rickets or Osteomalacia (any one can be considered)	
3	**o**	**The main hormones secreted by the thyroid gland is……** **Ans:** Thyroxine or Tetraiodothyronine (T4) and Triiodothyronine (T3).	**1M**
3	**p**	**Give any two examples of anti-histamines.** Ans:Diphenhydramine,Cetirizine,Chlorpheniramine,Cyclizine,Dimenhydrinate Doxylamine, Hydroxyzine, Meclizine. **(Any other correct examples can be considered) Ranitidine, famotidine etc.**	**1M**
3	**q**	**Mention two drugs used in the treatment of cancer.** Ans: Nitrogen Mustards, Cyclophosphamide, Methotrexate, Vinblastine, Vincristine, Uracil Mustards ,Fluorouracil **(Any other correct examples can be considered)**	**1M**
3	**r**	**Name one anti TB drugs used in resistant TB.** Ans: Bedaquiline, Pretomanid, Moxifloxacin ,PAS, Clycloserine, Ethionamide **(Any other correct example can be considered)**	**1M**
3	**s**	**Give an example of any one biological drug.** Ans: Asparginase,Abatacept,Belatacept,Cetuximab,Daclizumab,Elotuzumab,Golimumab,Pegaspargase. **(Any other correct example can be considered)**	**1M**
3	**t**	**Define biologicals.** Biologicals are those classes of medicines which are grown and then purified from large-scale cell cultures of bacteria or yeast, or plant or animal cells. OR Biologicals are a diverse group of medicines which includes vaccines, growth factors, immune modulators, monoclonal antibodies, as well as products derived from human blood and plasma.	**1M**